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Patentanmeldung Nr. Patent application No. Demande de brevet n°

02079056.4

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R C van Dijk

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Blu ray format with auxiliary audio and subtitles

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Blu Ray format with auxiliary audio and subtitles

The invention relates to a method of recording data on an optical medium

The Blu-ray Rewritable (RW) format for video recording has been finalised and now work is starting on a ROM publishing format to replace the DVD-Video format. One challenge in defining this ROM format is to ensure that players designed to work with the RW format can also play ROM discs (probably with limited functionality), thus we would like the ROM format to be partially compatible with the RW format.

Published content (movies) should have the possibility to select the language for the spoken text (audio) and for the Sub titles. In the DVD-Video system this is solved by multiplexing these streams in the TS multiplex (up to 8 Audio streams and 32 Sub picture streams). Disadvantages of this system and the implementation in Blu-ray are:

- The complete TS multiplex has to be read (also the not-selected streams).
- In the authoring phase the original content has to be modified, a new multiplex has to be made.
- There might be a forward compatibility problem when a RW system is reading this ROM disc.
  In the application for RW the sub pictures are not specified and only one audio channel is decoded.

The BD-ROM is formatted (specified) in such a way that the TS multiplex contains only Elementary streams which are available from the beginning. These are:

- Video ES
- Audio-1 [the background audio with the original spoken audio]
- Audio-2 [the background audio without the spoken audio].

In separate files spoken audio from other languages is stored and also in separate files the sub titling from other languages is stored.
This has the advantage that:

- The extra audio and sub titling can be added afterwards without changing the original content (TS multiplex).
- An RW drive can read and decode Video + Audio-1.
- Only zero or one auxiliary file is needed during playback.
  = No additional files if the original movie is played (as in RW).
  = One additional file in the following situations:
    * decoding audio-2 with one additional audio stream
    * decoding audio-1 with one additional sub titling stream.
    * decoding audio-1 and one additional sub titling stream (hearing aid).
- Not all data has to be read, only selected audio and subtitle stream. This results in a lower data bit rate.

Embodiments.

[redacted]

Embodiment A] :

= Minimize the number of jumps in the Main Transport Stream in case only the original audio (without subtitles) is used.

= No interleaving of the auxiliary audio in the Aux-audio file and subtitles in the Subtitle file. Larger chunks from the same audio language or subtitle language are read in one access.

One file with the Main multiplex which contains Elementary streams from Video, Audio-1, Audio-2. See fig.1

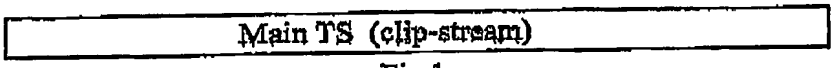

Fig.1.

One file with the Multi-language audio (Audio-3, Audio-4, ...). see fig. 2.
Note: Each of the subtitles could be stored in a separate file. This does not change the performance, only the number of files is increased. (See emb. C)

Fig.2

One file with the Multi-Subtitles (Sub-1, Sub-3, Sub-4...).
Also from the original language the subtitle is needed (hearing aid). In the numbering Sub-2 is skipped (there is no corresponding Audio) but this is not essential. See fig 3
Note: Each of the subtitles could be stored in a separate file. This does not change the performance, only the number of files is increased. See embodiment. c

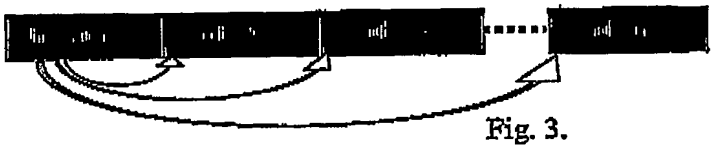

Fig. 3.

The location of these files on the disc may be as in fig. 4 and 5

Fig. 4

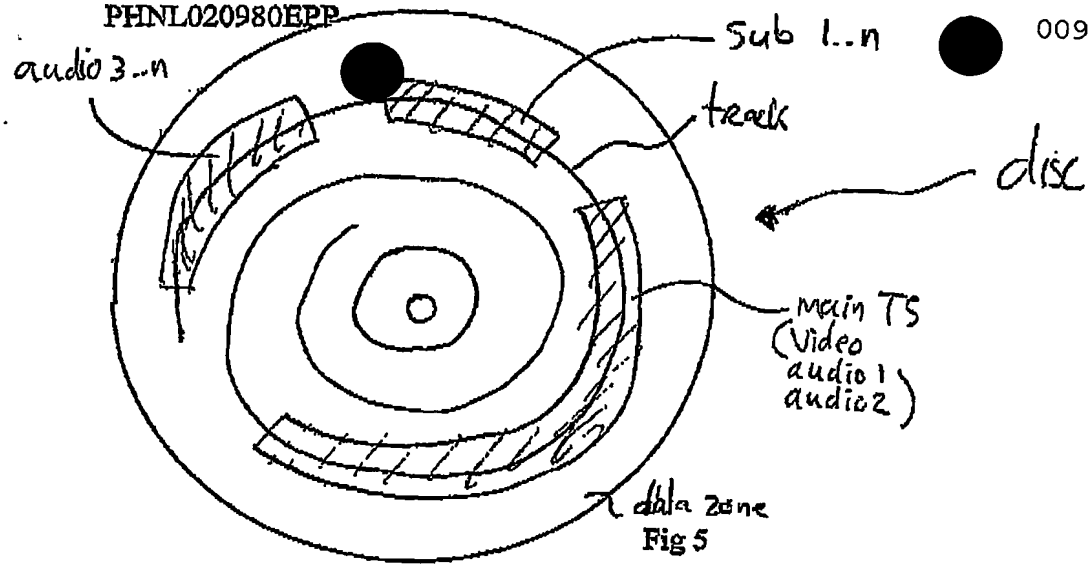

Fig 5

Selection mechanism during playback.

[1] Playback with the Original language.

1a: Without subtitles.

From the Main multiplex the audio-1 and audio-2 stream are read , only audio-1 is decoded. This is the most efficient way.

1b: With subtitles from a certain language.

From the Main multiplex the audio-1 and audio-2 stream are read , only audio-1 is decoded.

From the Subtitle file the data from the corresponding language is read. Jumping from Main TS to Subtitle file is needed but it does not occur often. The amount of Subtitles (on the time axis) which can be read in one access is large.

[2] Playback with a different language.

2a: Without subtitles

From the Main multiplex the audio-1 and audio-2 stream are read , only audio-2 is decoded.

From the Aux-audio file the corresponding audio language is read. Jumping from Main TS to Aux-audio file is needed but it does not occur often. The amount of audio (on the time axis) which can be read in one access is large.

2b: With subtitles from a certain language.

From the Main multiplex the audio-1 and audio-2 stream are read , only audio-2 is decoded.

From the Aux-audio file the corresponding audio language is read. Jumping from Main TS to Aux-audio file is needed but it does not occur often. The amount of audio (on the time axis) which can be read in one access is large.

From the Subtitle file the data from the corresponding language is read. Jumping from Main TS to Subtitle file is needed but it does not occur often. The amount of Subtitles (on the time axis) which can be read in one access is large

Embodiment B] :
= Have only small jumps in the Main Transport Stream. The jump times are short.
= Minimum number of files.

One file with the Main multiplex which contains Elementary streams from Video, Audio-1, Audio-2. See fig 6

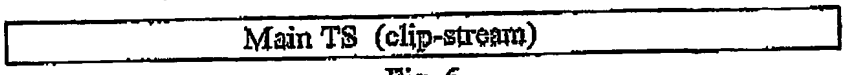

Fig. 6

One file with the Multi-language audio (Audio-3, Audio-4, ...).
The audio elementary streams are multiplexed in one Transport stream (Aux-audio TS) with one Time base. See fig 7

Fig. 7

One file with the Multi-Subtitles (Sub-1, Sub-3, Sub-4,..).
The Subtitle streams are multiplexed in one Transport stream (Subtitle TS) with one Time base. See fig 8

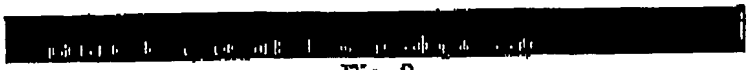

Fig. 8

The location of these files on the disc may be as shown in fig. 9 and 10

Fig. 9 (same color represents same TS)

The Aux audio and the subtitle data is on the disc interleaved with the Main TS.

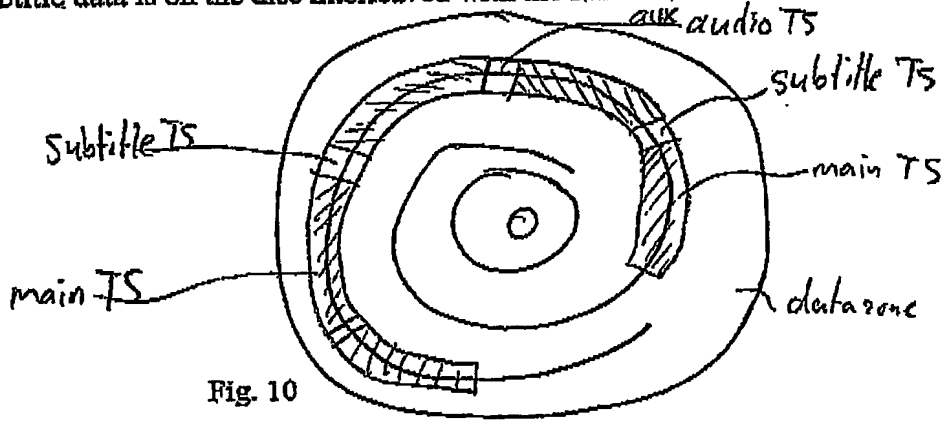

Fig. 10

During Playback
While reading the Main TS the corresponding audio or Subtitles can be read without jumping over a large distance. If Subtitles and/or Aux Audio are not needed then only small jumps are needed in the Main TS.
The location of the Aux audio and Subtitle information is an indication when the data can best be read.

Embodiment C] :
Combination of embodiment A and B.

One file with the Main multiplex which contains Elementary streams from Video, Audio-1, Audio-2. See fig 12

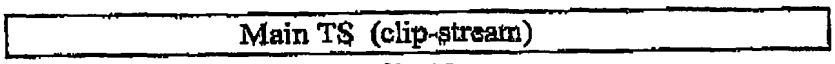

Fig 12

One file for each Multi-language audio (Audio-3, Audio-4, ...). see fig 13

Fig. 13

One file for each of the Multi-Subtitles (Sub-1, Sub-3, Sub-4...). see fig14

Fig. 14

The location of these files on the disc may be as shown in fig 15 and 16

pieces from one or more Subtitle files
pieces from one or more Aux audio files

Fig. 15

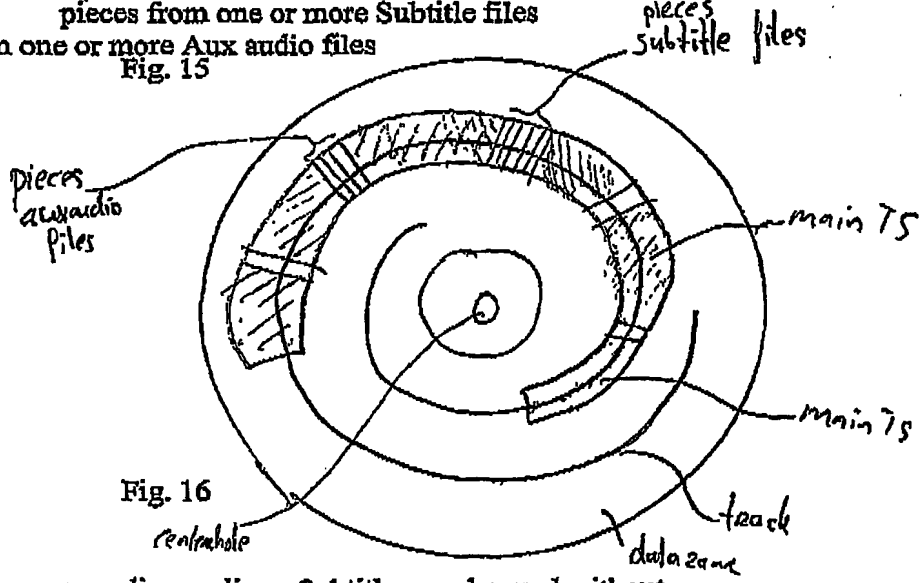

Fig. 16

During Playback
While reading the Main TS the corresponding audio or Subtitles can be read without jumping over a large distance. If Subtitles and/or Aux Audio are not needed then only small jumps are needed in the Main TS.
The location of the Aux audio and Subtitle information is an indication when the data can best be read.

Compared with embodiment B we now do not need to data from Audio or subtitle languages which we do not need. These are skipped.

High quality audio

Mandatory coding : AC3, LPCM (one of them).
Sampling frequency : 48 kHz, (96 kHz tbd)
Surround/Channels: AC3 => 5.1 (7.1 tbd).
LPCM => 2
Max bit rate : AC3 => 640 kbps [maximum for AC3]

Multi-audio: Two situations are distinguished.
In-the Multiplex stream: (currently DVD)
There is no reason to limit the number of streams in the multiplex but:
= from a practical point of view it might be convenient and
= care should be taken that the bit rate of the multiplex does not become too high.
Out-of-Multiplex stream (Now proposed for Blu Ray Disk). See embodiments
There might be additional audio for Still pictures and Menu's. This is stored outside the
multiplex. Coding might be different (e.g. MP3).

Method to implement subtitles in an MPEG2 TS is given in
EN300473 rev 1. February 2002: Subtitling systems [DVB]

For Implementing in Blu Ray standard Again two situations are distinguished.
In-the Multiplex stream: (currently in DVD)
There is no reason to limit the number of streams in the multiplex but:
= from a practical point of view it might be convenient and
= care should be taken that the bit rate of the multiplex does not become too high.
Out-of Multiplex stream (see embodiments)
Now proposed for Blu Ray Disk

Requirements:
- Subtitles for different languages (Latin and Asian fonts).
- Subtitles with enhanced graphical layout (logo, icons, ..)
- Subtitles for Karaoke.
- Subtitles are synchronised with Main Video.
- Subtitles in different regions on the display.

In Fig. 17 an optical medium according to the invention is shown.

CLAIMS

1. A method of recording data on an optical medium comprising:
writing original audio information in a first stream; and
writing language specific audio information corresponding to said original information audio in a second stream.
2. Any novel feature or combination of novel features as described herein

Layout of the disc according to the invention

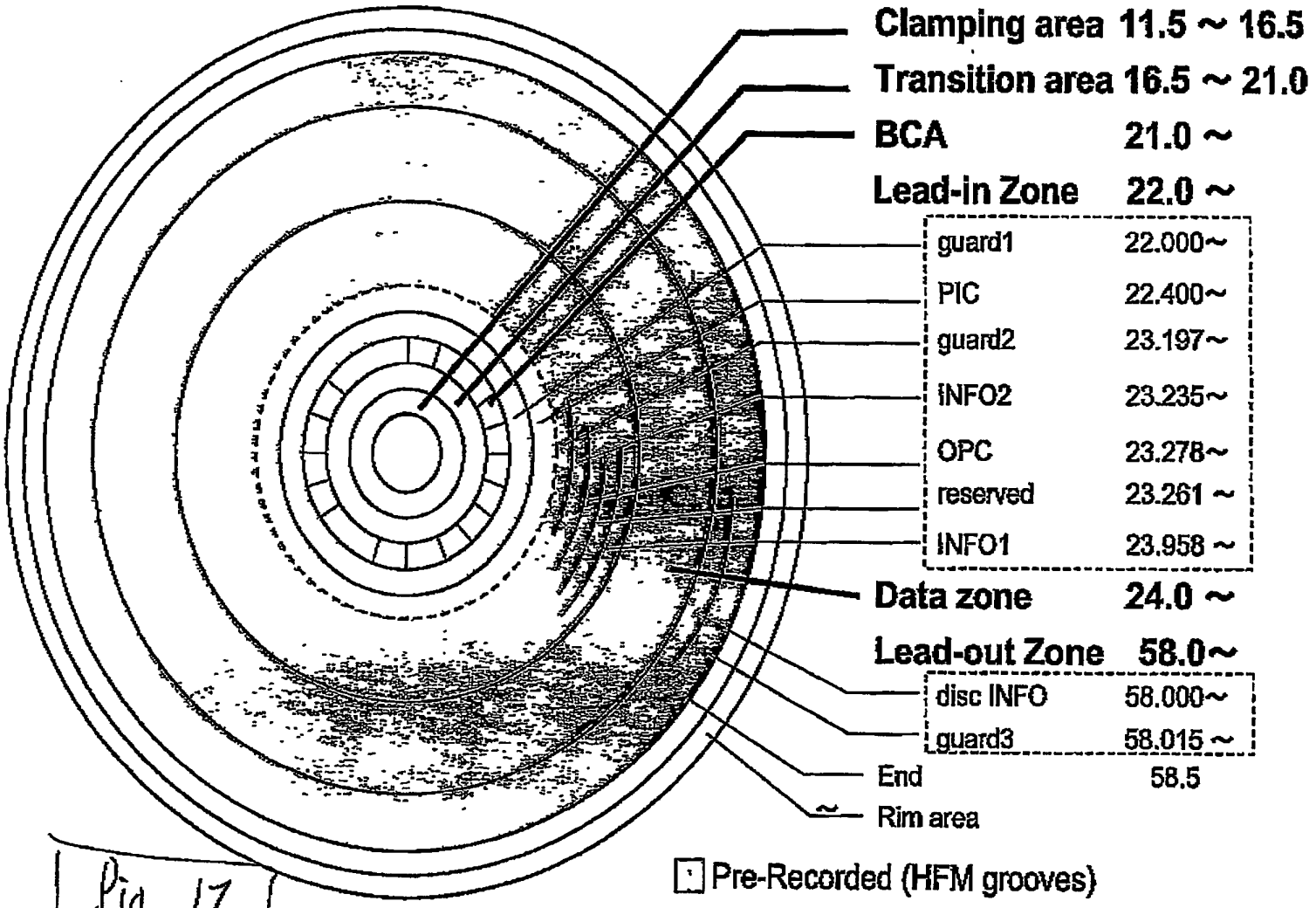

Fig. 17

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Let's make things better.

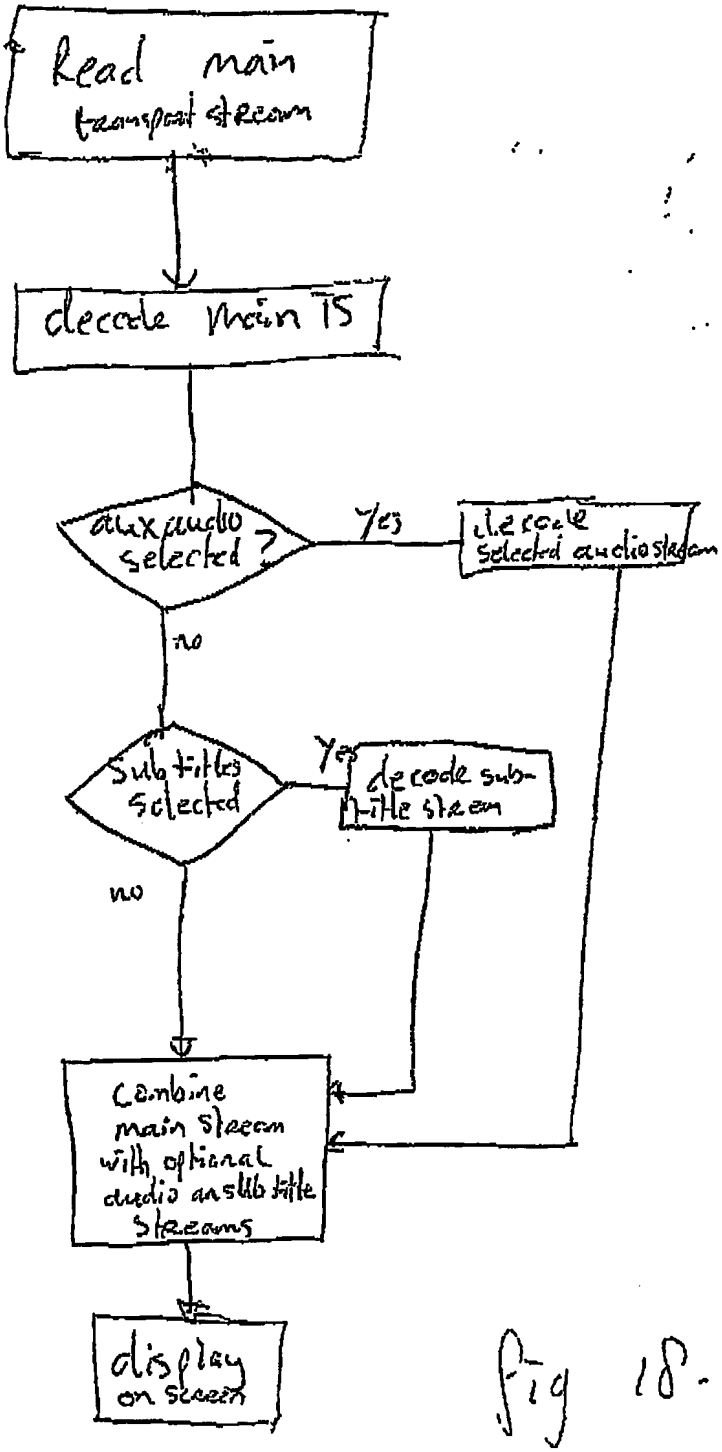

Fig 18.

Let's make things better

Fig. 1

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